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TREATED AT THE MASSACHUSETTS GENERAL HOSPITAL  
FROM THE FIRST CASE, IN 1822, UP, TO THE  
PRESENT DAY.*

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**THE MORTALITY OF ACUTE LOBAR PNEUMONIA,**

*From a Study of All the Cases of this Disease Treated at  
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THAT acute lobar pneumonia is treated to-day far differently than was the same disease fifty years ago is a well-known fact. Has there been any change in the mortality for the better or worse; and, if so, is this change due to the treatment alone, or is it dependent rather on the changed conditions of life and constitution of the patient, or is it due to any change in the nature of the disease itself?

These and similar questions present themselves, and cannot be answered by a superficial examination of mortality statistics, but demand a thorough examination of the individual cases. To make entirely plain what is meant by this statement, let us illustrate by the following example: Suppose ten patients sick with pneumonia were treated every year at a hospital, and that in the year 1860, of these ten patients, two were over sixty years of age, two were hard drinkers, and two had organic disease of the heart; while in the year 1880 nearly all the pneumonia patients happened to be healthy young adults, an entire change in the treatment having at the same time taken place. It is evident that the death-rate in these two years would be very different, a difference which a superficial observer might claim to be due to the change in therapeutics. But if, instead of merely examining the list of diseases and results,

he had examined the record of each case, it is possible he would have come to a far different conclusion.

At the suggestion of Dr. H. I. Bowditch and of Dr. F. C. Shattuck, and with the permission of the resident physician, Dr. J. W. Pratt, the writers have examined the records of the Massachusetts General Hospital from its first books in 1821 to the present time (May 1, 1889), for the purpose of throwing some light, if possible, on these questions.

But before considering the results, it may be well to review briefly some of the papers which have recently appeared discussing the same subject from data obtained from other hospitals. Dr. Hartshorne, in a paper read before the College of Physicians of Philadelphia, in February, 1888, apparently succeeded in demonstrating that the mortality from pneumonia has greatly increased. In the quarter of a century prior to 1858, he finds from a large number of statistics of cases reported by Skoda, Balfour, Dietl, from the British and United States armies, from European hospitals, and from the Pennsylvania Hospital, that the mortality from acute pneumonia was only  $8\frac{1}{3}$  per cent. This certainly contrasts in a striking way with the present mortality, which was found by the Collective Investigation Committee,<sup>1</sup> in an analysis of 1066 cases, to be 18 per cent., and which Dr. Hartshorne has found to be stated at about 25 per cent., or more, in the large general hospitals in this country. He thinks that the disease is now practically the same as it was forty or fifty years ago, and that the increase in mortality is due to the change in treatment. To show the great evils of opium, Dr. Hartshorne gives such statistics—among others—as the following: One case in 12.56 died where the treatment consisted of bleeding and the use of tartar emetic; while where opium without bleeding was used, as many as 1 case in 3.3 died. Such statistics, it seems to us, are worse than valueless, for not one word is said as to whether

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<sup>1</sup> The Collec. Invest. Record, vol. ii., July, 1884.

the cases were old or young, feeble or strong, debilitated by alcoholic habits or not; neither do they take into consideration a possible variation in the severity of the disease, a fact which is generally recognized in the study of other specific diseases.

Dr. William Osler<sup>1</sup> gives a striking illustration of the worthlessness of statistics taken without such analysis for the purpose of defending a theory, by figures taken from the same hospital (Pennsylvania Hospital), for a different series of years, which, far from showing, as do Dr. Hartshorne's figures, that the mortality has increased, show that it has, if anything, been reduced, as will be seen by these figures:

DR. HARTSHORNE'S STATISTICS.		DR. OSLER'S STATISTICS.	
Years.	Mortality.	Years.	Mortality.
1845-'47	6.25 per cent.	1848-'50	37.9 per cent.
1865-'67	18.50 "	1858-'60	21.2 "
1884-'86	31.00 "	1868-'70	22.8 "
		1878-'80	32.7 "

Of 704 cases treated at the Pennsylvania Hospital since 1845, Dr. Osler finds a mortality of 29.1 per cent.

Dr. Osler also gives, without special analysis, the mortality of the Montreal General Hospital and the Charity Hospital of New Orleans, as follows:

MONTREAL GENERAL HOSPITAL.		CHARITY HOSPITAL, N. ORLEANS.	
Years.	Mortality.	Years.	Mortality.
1853-'63	16.2 per cent.	1830-'39	44.6 per cent.
1863-'73	16.1 "	1840-'49	35.3 "
1873-'83	23.7 "	1850-'59	32.2 "
1883-'87	20.3 "	1860-'69	43.9 "
		1870-'79	40.2 "

Out of a total of 1012 cases at the Montreal Hospital, since 1853, there was a mortality of 20.4 per cent.; of 3969 cases treated at the New Orleans Hospital, 38.01 per cent. were fatal. The increasing death-rate from north to south, as illustrated by these hospitals, is interesting.

Osler also gives figures from the Edinburgh Infirmary as follows:

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<sup>1</sup> University Medical Magazine, November, 1888.



Before 1848, mortality in 567 cases . . .	36.3 per cent.
1848-1856, " " 611 " . . .	21.2 "
1856 upwards, " " 548 " . . .	12.7 "

A further analysis of these cases might show that this decrease in death-rate was deceptive.

Dr. Gouverneur Smith,<sup>1</sup> in a recent article, says that the lowest mortality from pneumonia, at the New York Hospital, occurred in the decade between 1820 and 1830; that the mortality has been rising since then, and has during the last decade reached its acme, considerably over double the earlier percentage. As he truly remarks, however: "Hospital statistics, in order to afford valuable scientific data, must be sifted and classified in groups of cases." He then goes on to say: "Without any such general and accurate figures to guide us relating either to hospital or private practice in this country, but from such sources of inference as are at hand, and from observation, it is now an accepted fact that the death-rate from pneumonia is much greater at present than it has been hitherto." This, to say the least, is a very sweeping assertion.

Recognizing the great danger of fallacious reasoning from hospital statistics, the writers have endeavored, with minds freed as much as possible from preconceived ideas, to analyze each case of acute lobar pneumonia that has been entered in the record books of the Massachusetts General Hospital. In the earlier years the table of diagnoses in the end of each record book was found to be often unreliable, and they were obliged to make their own diagnosis directly from the records. Thus, before 1830, clear cases of acute lobar pneumonia were often found among the diseases entered as "empresma pleuritis," all of which, therefore, had to be examined for this purpose. On the other hand, cases entered as pneumonia, or "empresma pneumonitis," in these earlier days were often clearly cases of broncho-pneumonia or of phthisis. It is evident, therefore, that statistics drawn up from the

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<sup>1</sup> Medical Record, October 20, 1888.



list of cases of pneumonia as entered in the table at the end of each record book would show very different results in the earlier years from those we have obtained by a decidedly longer process.

Added to these difficulties was the fact which one can hardly realize now in the day of careful record of physical signs, namely, that before November, 1864, there is no record of the temperature of the patient, and the first temperature chart was made in February, 1867, but these charts did not come into regular use until several years later. Then, too, in the earlier days, examinations with the stethoscope were first coming to be practised, and were entered in the record book as if they were a great curiosity, as these records certainly are now. In cases entered before 1835 there was often no record of physical signs, and we were obliged to infer the seat of the lung lesion from the description of the symptoms. The prolixity of the earlier records, extending over a number of pages, and the unmethodical and, as compared with recent records, unscientific manner of recording facts is very striking. It is often said that as we depend at the present day so much on the observation of instruments of precision, like the thermometer, we neglect to observe the patient; but the writers were both impressed with the abundance in the earlier records of unessential details, and the absence oftentimes of important symptoms and phenomena which should have been noted.

After these introductory and explanatory remarks let us examine the cases.

The Massachusetts General Hospital was opened for patients in 1821, and from January, 1822, when the first case of acute lobar pneumonia was admitted, up to the present time, May 1, 1889,<sup>1</sup> exactly one

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<sup>1</sup> The writers were obliged to wait till this late date, May 1, in order to obtain just one thousand cases. It may be remarked here that the writers examined independently alternate volumes of the records, and were interested to find how closely their number and percentages corresponded.

thousand cases of this disease are to be found in the records of the hospital. Of this number, two hundred and fifty were fatal, or exactly twenty-five per cent. of all cases.

The following table shows the total number of medical cases in the hospital for each year, also the number of cases of pneumonia and the number of deaths among the latter.

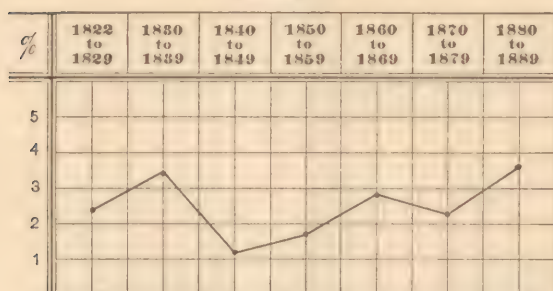
TABLE SHOWING NUMBER OF MEDICAL PATIENTS AND OF CASES OF PNEUMONIA IN THE MASSACHUSETTS GENERAL HOSPITAL FOR EACH YEAR.

Year.	Number of medical patients.	Cases of pneumonia.		Year.	Number of medical patients.	Cases of pneumonia.	
		Total.	Died.			Total.	Died.
1822	67	2	1	1857	418	7	1
1823	111	1	0	1858	456	19	4
1824	225	0	0	1859	530	11	3
1825	229	6	0	1860	494	15	6
1826	321	8	1	1861	543	10	2
1827	339	5	0	1862	606	13	4
1828	291	16	3	1863	703	28	7
1829	354	11	0	1864	669	24	6
1830	287	7	1	1865	390	10	2
1831	326	18	2	1866	377	9	0
1832	318	10	1	1867	459	7	2
1833	328	7	2	1868	456	12	3
1834	335	15	4	1869	544	19	7
1835	311	13	2	1870	518	11	2
1836	326	6	0	1871	563	18	0
1837	255	10	2	1872	652	21	2
1838	208	6	3	1873	691	12	4
1839	211	7	1	1874	740	20	8
1840	205	2	0	1875	852	24	8
1841	217	1	1	1876	829	20	4
1842	189	7	2	1877	687	11	6
1843	186	4	1	1878	713	17	6
1844	242	2	1	1879	658	15	1
1845	225	2	1	1880	814	33	6
1846	238	6	1	1881	830	27	8
1847	309	3	0	1882	796	38	11
1848	414	7	0	1883	701	26	9
1849	448	4	1	1884	803	39	13
1850	335	4	0	1885	918	57	16
1851	412	3	0	1886	930	39	5
1852	382	2	0	1887	1140	55	21
1853	470	6	4	1888	1285	72	21
1854	443	7	0	1889	} to May 1	.....	39 7
1855	402	5	3				
1856	440	8	4				

As until very recently the total number of cases each year was too few from which to draw conclusions of any value, we have divided the figures into periods of ten years, making seven decades in all from 1822 to 1889.

Incidentally, we find a very varying proportion between the number of cases of pneumonia and the total admissions as shown by Chart 1.

CHART I



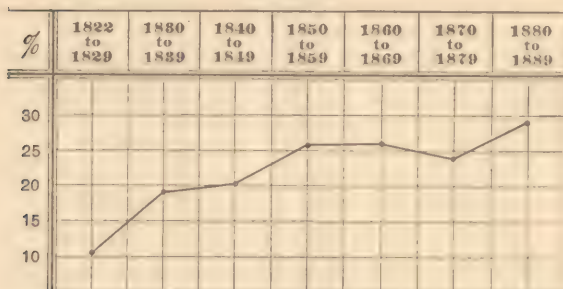
Percentage of cases of pneumonia to total medical cases,  
in decades.

It will be seen that in the last decade a proportionately larger number of cases of pneumonia have been admitted. It is hardly fair to conclude from this, however, that pneumonia has become more prevalent, as we must remember that with the modern ambulance system many very sick patients are taken to the hospital, while in former years the absence of this system would prevent many who were taken sick with this disease of sudden onset from receiving hospital care. In the 1830 decade, however, nearly as large a percentage of pneumonia cases were admitted to the hospital, while the lowest percentage occurred in the '40's.

A glance at the table giving the cases and mortality in each year shows great variations; in some years no deaths having occurred from pneumonia, in other years a large proportion were fatal. Ar-

ranged in decades and represented graphically we obtain the following chart:

CHART II.



Percentage of deaths from pneumonia to all cases of pneumonia, in decades.

This shows an almost unbroken rise in the mortality from ten per cent. in the 1820 decade to twenty-eight per cent. in the present decade. From this we might infer that pneumonia is much more fatal now than it was fifty years ago, and much more fatal fifty years ago than it was seventy years ago, and that its fatality is steadily increasing—a conclusion well calculated to alarm and depress us.

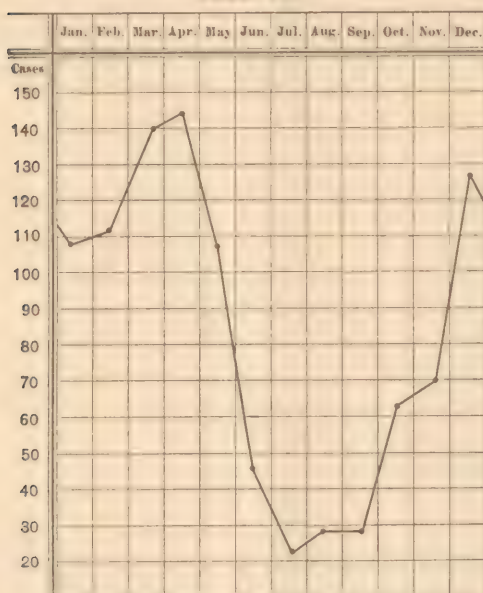
As we have urged in the introductory part of this paper, conclusions like this should not be drawn until we have examined each individual case, else we may be entirely misled. We all know that the treatment of pneumonia, as of other diseases, has radically changed during the period of years we are considering, but before appealing to this factor as a cause of the change in mortality, let us examine the other factors, which perhaps may partly or entirely be the cause.

We have noted in each case the age, sex, race, previous condition, whether healthy or delicate, whether temperate or intemperate in the use of alcohol, and also the presence or absence of complications. All these are factors of more or less importance in their relation to the mortality. We have



also noted the month of the year and the site of the lesion of the lung, together with the duration of the fever, till death or recovery, and the length of stay in the hospital. The month of the year and the site of the lung lesion, although having but little bearing on the present discussion, are of interest for statistical purposes, and are, therefore, recorded here in the following chart and table :

CHART III.



Total number of cases of pneumonia in each month.

A comparison of this chart with one prepared by one of the writers<sup>1</sup> from an analysis of 412 cases occurring at the Massachusetts General Hospital between 1870 and 1885, shows a great similarity. We calculated the per cent. fatal in each month, but from the irregularity of the results concluded that they were of no significance.

<sup>1</sup> C. W. Townsend: An analysis of 412 cases of lobar pneumonia, etc. Boston Med. and Surg. Journal, March 25, 1886.

TABLE SHOWING PORTIONS OF LUNG INVOLVED IN  
ORDER OF FREQUENCY.

Seat of lesion	Total.	Died.	Per ct. fatal.
Lower right lobe . . .	337	47	14
Lower left lobe . . .	216	28	13
Both lungs . . .	111	63	57
Upper right lobe . . .	105	25	24
Whole right lung . . .	74	39	53
Whole left lung . . .	39	26	67
Upper left lobe . . .	31	7	23
Middle right lobe . . .	19	4	22

We determined the day of death in all the fatal cases, where this was possible, and found, as shown by the following table, that the eighth day was the one on which most deaths occurred.

TABLE OF DAY OF DEATH.

3d day . . . . .	7 cases, or	3 per cent.
4th " . . . . .	7 " "	3 "
5th " . . . . .	19 " "	7 "
6th " . . . . .	14 " "	6 "
7th " . . . . .	19 " "	8 "
8th " . . . . .	31 " "	13 "
9th " . . . . .	26 " "	11 "
10th " . . . . .	22 " "	9 "
11th " . . . . .	17 " "	7 "
12th " . . . . .	10 " "	4 "
13th " . . . . .	7 " "	3 "
14th " . . . . .	9 " "	4 "
3d week . . . . .	23 " "	9 "
4th " . . . . .	7 " "	3 "
5th " . . . . .	5 " "	2 "

The duration of the fever could not, before the days of the thermometer, be determined with accuracy, but the following table gives this as nearly as possible.

TABLE OF DURATION OF FEVER.

4 days in . . . . .	15 cases, or	2.3 per cent.
5 " . . . . .	35 " "	5.3 "
6 " . . . . .	55 " "	8.4 "
7 " . . . . .	116 " "	17.7 "
8 " . . . . .	119 " "	18.2 "
9 " . . . . .	88 " "	13.4 "
10 " . . . . .	79 " "	12.0 "
11 " . . . . .	46 " "	7.0 "
12 " . . . . .	29 " "	4.4 "

13 days in . . . . .	19 cases, or	2.9 per cent.
14 " . . . . .	26 " "	3.9 "
15 " . . . . .	12 " "	1.9 "
16 " . . . . .	5 " "	0.7 "
17 " . . . . .	5 "	
18 " . . . . .	2 "	
19 " . . . . .	2 "	
20 " . . . . .	3 "	
21 " . . . . .	4 "	
Over 3 weeks in . . . . .	12 "	

Of 212 occurring between 1870 and 1885, 128 cases ended by crisis and 84 by lysis.

Of the two sexes, there were 724 males and 276 females, of which 182, or 25 + per cent. of the former, while 68, or 25 — per cent. of the latter were fatal. The great preponderance of males, about four times as many, is due to the fact that in early years there were, we believe, larger accommodations for male than female patients, and, as a rule, men with acute diseases are perhaps more likely to be taken to a hospital than women. The British collective statistics from private practice show, however, a similar but not as great disproportion between the two sexes; they record about twice as many males as females. As the mortality in the two sexes was in our cases the same, although usually stated to be higher in females, the factor of sex is excluded in our search for the cause of the increase in the fatality of the disease.

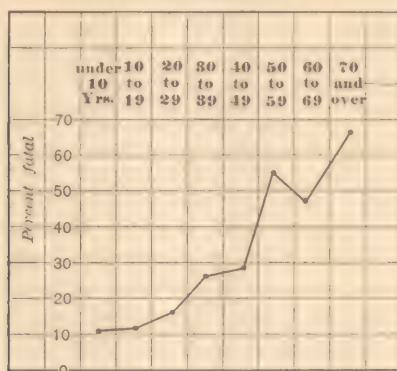
The factor of age is, however, one of great importance, as shown by the following table, and graphically by Chart IV.

Age of patient.	Total cases.	Fatal.	Per ct. fatal.
Under 10 years . . . . .	10	1	10.0
10 to 19 " . . . . .	113	12	10.6
20 " 29 " . . . . .	373	69	18.5
30 " 39 " . . . . .	217	55	25.3
40 " 49 " . . . . .	136	40	29.2
50 " 59 " . . . . .	80	44	55.0
60 " 69 " . . . . .	32	15	46.9
Over 70 " . . . . .	12	8	66.7

It will be seen that up to the age of 49 years the mortality gradually increases from 10 per cent. to

29 per cent. After this age it makes a sudden jump of over 20, and rapidly rises above 50 per cent. As only ten cases occurred under 10 years of age, it is hardly fair to lay much value on this mortality rate of 10 per cent., which is probably too high. The only fatal case in this class was a child  $2\frac{1}{2}$  years old, emaciated and enfeebled from previous neglect and bad treatment.

CHART IV.



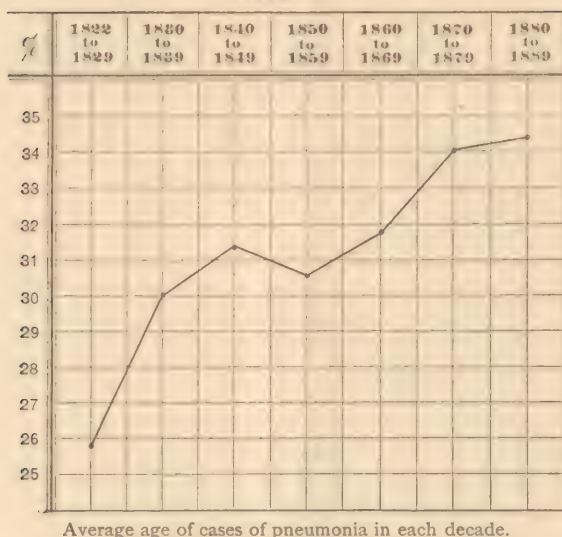
Mortality at different ages.

The break in the rising line of mortality in those between 60 and 69 years of age may be explained by the fact that 60 per cent. of these patients happened to be neither complicated nor intemperate, while of those between 50 and 59 years of age only 55.5 per cent. were free from complication or intemperance. A similar chart in the analysis of 412 cases previously referred to, corresponds almost exactly with Chart IV, but the fall at 60 years does not occur.

Now, an examination of the hospital records shows not only a proportionately greater number of patients over 50 years of age in the latter decades, but the average age, as will be seen by Chart V., has steadily increased from  $25\frac{1}{2}$  years in the '20 decade to  $34\frac{1}{2}$  years in the '80 decade.



CHART V.



Here, then, is one cause at least for the higher death-rate in later years, and one which is, of course, entirely independent of treatment.

A complete record of the condition of the patient previous to the attack of pneumonia would be of great value, but, unfortunately, was not kept in many of the cases. 445 of the patients were stated to have been healthy; of these, 62 died, or 14 per cent., a percentage considerably under the average. 67 were stated to have been delicate, no especial disease existing; of these, 26 died, or 39 per cent. 161 had acute or chronic complications, and of these, 59 died, or 37 per cent. The complications, with the number of deaths in each, are given in the following table :

TABLE OF DISEASES COMPLICATING PNEUMONIA.

Disease.	Total cases.	Number fatal.
Asthma . . . . .	6	4
Bleeder . . . . .	1	0
Bronchitis, chronic . . . . .	11	5
Cardiac disease . . . . .	18	5
Delirium tremens . . . . .	23	15
Diabetes . . . . .	1	0
Diarrhoea (severe) . . . . .	6	3
Embolism, cerebral . . . . .	1	1
Embolism, pulmonary . . . . .	1	1
Emphysema . . . . .	2	1
Empyema . . . . .	6	3
Erysipelas, facial . . . . .	1	0
Gangrene of lung . . . . .	3	3
Gastro-duodenal catarrh . . . . .	1	0
Hiccough (persistent) . . . . .	1	1
Hemiplegia . . . . .	1	1
Hemiplegia following pneumonia . . . . .	1	0
Idiocy . . . . .	11	2
Intermittent fever . . . . .	13	3
Lateral curvature . . . . .	1	1
Measles . . . . .	2	1
Meningitis . . . . .	1	1
Nephritis . . . . .	9	4
Pericarditis . . . . .	3	2
Peritonitis . . . . .	2	1
Perityphlitis . . . . .	1	1
Phthisis . . . . .	22	7
Pleurisy with effusion . . . . .	17	4
Pott's disease . . . . .	1	1
Pregnancy with miscarriage . . . . .	2	0
Pregnancy without miscarriage . . . . .	2	0
Rheumatism, acute . . . . .	8	1
Surgical injury . . . . .	1	1
Typhoid fever . . . . .	22	10
Total complications . . . . .	193	85
Counted twice . . . . .	32	26
Total patients with complications . . . . .	161	

55 were recorded as temperate in the use of alcohol, of whom 8 died, or 15 per cent., while 109 were intemperate, and 45 died, or a mortality of 41 per cent.

The influence which the presence or absence of complications, of good health and of temperance have on the mortality of acute pneumonia is a fact

well recognized, and is duly emphasized by the above analysis. We must next find whether complications and intemperance are more or less prevalent among pneumonia patients at the hospital now than they were in former times.

An objection will undoubtedly be raised here that in former days complications were not so readily recognized as at present, and that particularly in post-mortem examinations the pathologist almost always finds some abnormal conditions which were passed over in silence because not recognized in the older records. Therefore, we should expect to find complications more prevalent in later years. As we felt the danger of this, we think we have avoided it by recording only those cases as complicated where the diagnosis was plain, and where the lesion, if observed post-mortem, was a gross one, and one that was as easily recognized by early as by late reporters. We think all will admit this on examining the list of complications. The complication emphysema, it seemed to us, might be rather too fine a diagnosis for our list, but of the two cases one occurred in the '30 decade and one in the '80 decade, so this certainly ought to remain. Pericarditis, another example, occurred once in the '30, once in the '60, and again in the '80 decade.

Diarrhœa is entered in our list, but only the very severe and generally chronic cases are there mentioned, for a slight or moderate diarrhœa is, as is well known, a not infrequent symptom in pneumonia.

Many of the complications, as will be seen, are chronic, antedating the attack of pneumonia, while the rest, with but few exceptions, although acute, are entirely accidental and independent of the pneumonia. The exceptions, gangrene of the lung, empyema, and in some cases pleural effusion, being a part, as it were, of the pneumonia, should perhaps have been excluded, as it may be said that their occurrence may have been due to the treatment; but these cases are so few in comparison with the others,

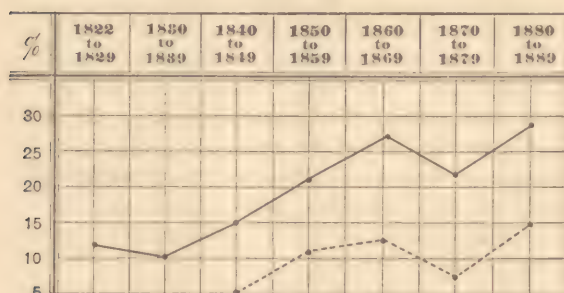
and are so evenly distributed through the decades, that they will not influence the results.

The following table shows the number of cases that were complicated or simply delicate, and the number intemperate in each decade.

	1822 to 1829.	1830 to 1839.	1840 to 1849.	1850 to 1859.	1860 to 1869.	1870 to 1879.	1880 to 1889.
Complicated or delicate, }	6	11	6	15	39	37	114
Intemperate,	0	2	2	2	18	12	66

Calculating the percentage of these cases to the total number of cases of pneumonia, we find that this percentage, both of the complicated and delicate and of the intemperate, has been increasing, as shown by Chart VI.

CHART VI.



Ratio of the complicated and delicate cases to total number of cases of pneumonia, represented thus. — Ratio of intemperate cases to total number, thus. . . .

The only remaining factor is that of race, and our 1000 cases are divided as follows:

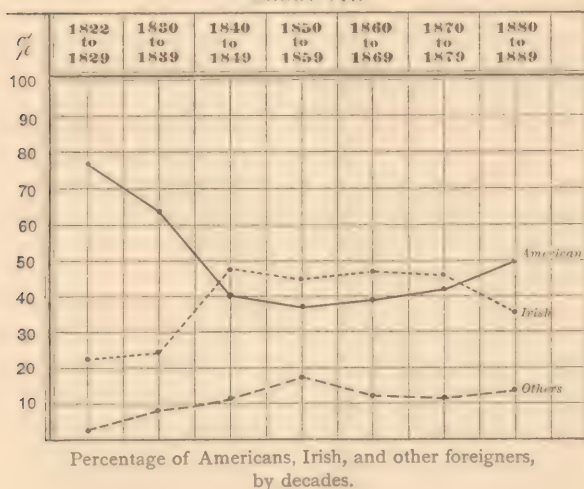
	Total cases.	Fatal.	Per ct. fatal.
American (including Canadians)	463	103	22
Irish . . . . .	371	94	25
Other foreigners . . . . .	119	36	30
Not recorded . . . . .	47	17	36
Total . . . . .	1000	250	Aver. 25

This table shows the least fatality among the Americans, a greater fatality among the Irish, and a still greater one among other nations; but we have



no right to infer that the race factor itself is the cause of this difference. Patients of foreign birth who are taken to the hospital are perhaps of greater age, or more liable to have complications or to be intemperate than those of American birth, and these factors may account for the difference in mortality. It occurred to us, therefore, that it would be interesting to see what the percentage of mortality would be in the different races, omitting all those fatal ones who were over fifty years of age who were intemperate, delicate, or complicated, factors which we have shown are sufficient cause for a large mortality. The results obtained are as follows: Americans, 9 per cent. fatal; Irish, 11 per cent. fatal; other foreigners, 14 per cent. fatal. Comparing these percentages with the former ones, we find that the proportionate mortality of the different races remains almost as before, with the exception that Americans are even more favored than by the first analysis, while among foreigners, with the exception of the Irish, the mortality is proportionately greater than before. The reason of this may be that our most poorly nourished classes are largely foreigners.

CHART VII.



During the early part of the century American patients were, of course, more abundant, relatively, than they are now; a fact which is shown by Chart VII., which gives the percentages of the three classes among the pneumonia patients in the hospital by decades.

From the descriptions of the disease contained in the records there seems to be no reason for thinking that the character of pneumonia has susceptibly changed in this series of years.

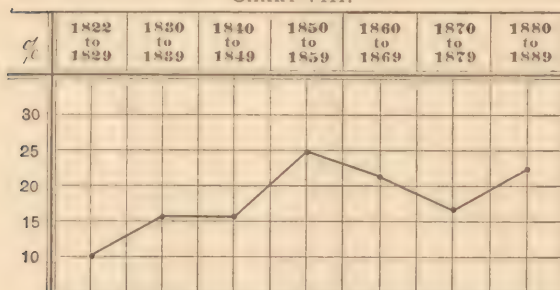
To sum up the results of the analysis, so far, we may say that the sex of the patient has in these cases no influence on the mortality; that the age of the patient is of great significance—the older the patient the greater the mortality; and that over the age of fifty years more than fifty per cent. die; that intemperate patients are far more apt to die than temperate patients; and that the mortality in the patients who are delicate or who have some complication is much higher than in the healthy and non-complicated; and, finally, that the proportion of deaths among Americans is less than among Irish, and in these latter less than among other foreign nations, and that this difference is not dependent as far as our studies show, on the existence of more frequent complications or intemperance among foreigners.

We have also seen that the average age of the pneumonia patients has been steadily increasing from the earliest decades of the hospital to the present day; that the relative number of intemperate and of delicate patients has increased, and also of cases complicated by other diseases, and, finally, we have seen that the proportion of foreign-born patients has also increased.

Let us see how much influence each of these factors has had in increasing the mortality from pneumonia in the hospital, and whether it is possible that all of them together may not be the whole cause, and that it will not be necessary, as might have been our first impulse, to appeal to the change of treatment as the cause of this increase in the mortality.

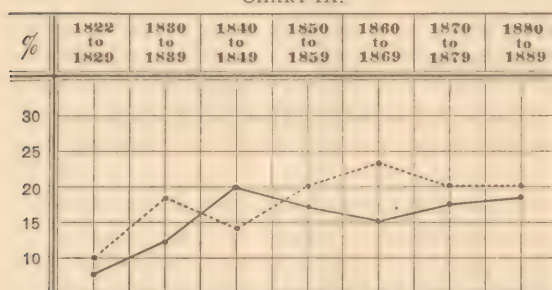
In order to learn the answer to these questions we have prepared the following charts which we think explain themselves:

CHART VIII.



Percentage of mortality from pneumonia, omitting those who died over fifty years of age, by decades.

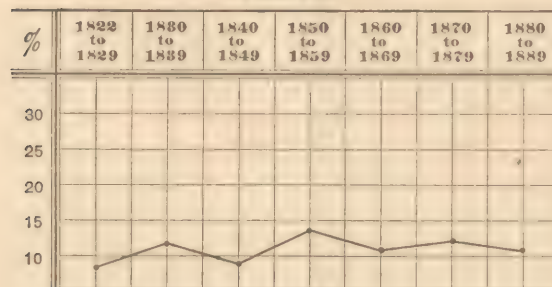
CHART IX.



Mortality, omitting the delicate and complicated who died, represented thus ————

Mortality omitting the intemperate who died thus .....

CHART X.



Mortality by decades, omitting all fatal ones who were over fifty years of age, or were delicate, complicated, or intemperate.

This last chart represents, then, the mortality in the hospital by decades, excluding all cases whose death can reasonably be accounted for, that is to say, all who died who were over fifty years of age, were intemperate, delicate, or who had complications. As will be seen, instead of showing as in Chart II., a regular and decided increase in the mortality from the earlier part of the century to the present day, it shows but little variation from decade to decade, and we certainly could not infer from this chart that the mortality from pneumonia had on the whole changed in the last sixty-eight years.<sup>1</sup>

We must conclude, therefore, that, as shown by this analysis, the mortality of acute lobar pneumonia at the Massachusetts General Hospital has remained practically the same from 1822 to 1889, notwithstanding the great changes in treatment, and that the disease is the same now as it was sixty-eight years ago. This result, although not very encouraging, is certainly far better than was the hasty conclusion drawn from the mortality table alone before analyzing the cases.

But are we to infer that treatment is of no avail? Has it not had any influence on the duration of the disease or of the convalescence, and how has the general condition of the patient in these two stages been influenced by the treatment? A short *résumé* of the treatment at different periods is necessary before we can answer these questions.

Prior to the year 1850 the treatment was truly heroic; almost every case was vomited and purged, given mercury to salivation and sore gums, blistered with cantharides, and bled. Of the 187 cases before 1850, 115 or nearly two-thirds were bled. The quantity of blood taken was often large. In 1833 one case was bled three times to the total amount

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<sup>1</sup> It is probable if we had taken into consideration the increase in foreigners and the decrease in Americans of late years, that Chart X. would have been more nearly a horizontal line than it is now.



of fifty ounces, and forty-eight leeches in all were applied during his illness. Another case was bled during his illness sixty ounces, or nearly two quarts. Local wet-cupping and leeching at the same time with venesection were also used.

The diet in this period was a low one, as can be seen by the following examples taken from the records: "May have juice of quarter of an orange at a time." "May have a teacup of milk three times daily with cracker." "May have broth not exceeding four ounces and repeat in four hours if he wants it." This low diet was also continued into the convalescence. Thus, in 1849, a patient on the fifth day of the convalescence was allowed "Broth six ounces at noon."

In the '40's mercury and emetics were less frequently used, but the patient was still given tartrate of antimony and kept on the verge of vomiting. Blisters at this time were also gradually omitted and replaced by sinapisms.

Cantharides, besides producing much local effect, was a frequent cause of strangury, so that catheterization had to be resorted to. The sores made by the blister were irritated by various drugs in order to obtain a more intense effect, so that gangrenous sloughs and ulcers slow in healing were not infrequent results. During the convalescence such records as these were not uncommon: "Complaints of nothing but ulcer left from blistering." "The black slough from the blister beginning to separate."

Cathartics were given freely, not only in the hospital but before their arrival there. One case, a man of twenty-three years, was said to have had fifty dejections on the third day of the disease after taking cathartics at his home, and it seems as if the fatal result might be attributed to this.

Before 1850, opium was scarcely ever used, and in no case was the treatment an expectant one. The occasional use of colchicum and other drugs was noticed. Stimulants during the period before 1850 were almost never given, and then only in minute

quantities, generally just before death. For example, one of the earliest mentions of its use is in 1839, when the following record occurs: "May have a tablespoonful of cider." In another case: "Wine whey if skin becomes cold;" this was given a few hours before the patient's death. As another example, may be mentioned a patient forty-four years of age with a complicating pericarditis and the history of a cough for ten years, who was kept on a low diet, was bled, vomited, purged, and blistered, and was not given any alcohol. The patient died.

From 1850 to 1860 seems to have been a transitional period in the hospital treatment of this disease, and for the first time we meet with cases which were treated practically in an expectant manner, 11 out of 72 cases being so treated in this decade. Opium in occasional moderate doses, generally in the form of Dover's powder, was then used for nearly the first time; syrup of Tolu and "fever mixtures" containing nitre were also given, and an occasional administration of quinine and veratrum viride was also noticed. Less than one-third (19 cases) were bled, and the other heroic measures were proportionately decreased. Alcohol was used more frequently just before death, but the fear of giving it while there was fever is evident from such a record as this in 1858: "May have cider 3vj or 3viiij in the twenty-four hours if no more fever."

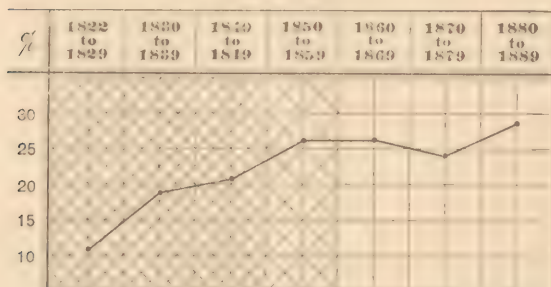
Soon after 1860, the records show that pneumonia patients were being systematically fed with milk and broths. Heroic treatment became a thing of the past, emetics, cathartics, mercury, and blisters being discarded, and there are records of but six cases of venesection after the year 1860, and leeches were used in only a very few. Alcohol was given systematically from this time. Of 741 cases treated since 1860 there is record of the use of alcohol in 353 cases. A comparison of the mortality of those to whom stimulants were given and those treated without them would be useless, for the more severe and

feeble cases were given alcohol, and nearly all received it before death.

The treatment by drugs was slight after 1860. In the 60's and early in the 70's wine of ipecacuanha in small doses was largely used. After 1875 carbonate of ammonium was the drug most frequently prescribed. Opium was given in many of the cases, generally in moderation, to relieve pain. Digitalis was also used to some extent. There are but very few records of quinine in the large doses sometimes used in New York and elsewhere. In the last few years antipyrin and acetanilid have been used in a few cases, but we may say that, as a rule, since 1860 the treatment of pneumonia at the hospital has been largely sustaining and expectant.

A glance at Chart XI., which is the same as Chart II., but shaded to indicate the periods of different

CHART XI.



Same as Chart II., also showing periods of treatment. Before 1850 heroic; between 1850 and 1860 transitional; after 1860 expectant.

treatment, shows that the entire rise in the mortality took place during the period prior to 1860, when the treatment was entirely or partly heroic.

This fact alone, even if we had not demonstrated the same truth by another method, shows the entire lack of connection between the mortality rate and the method of treatment.

Is it possible that the heroic treatment contained both bad and good elements, which by counteract-

ing each other, gave, as we have seen, exactly the same results as by the expectant method; and, therefore, if the bad elements were eliminated we should have better results than by the expectant method? In the light of our present knowledge of the bacterial nature of the disease, is it possible that the germicidal mercurial treatment constituted the good element?

After this digression let us now answer the questions as to the duration of the disease and of its convalescence as affected by treatment. We obtained the average duration of the fever and found it to vary in each decade but a small fraction from nine days. The duration of the convalescence also, as shown by the length of stay in the hospital, has not changed, for in each decade the average stay of each patient varied but very little from three weeks and four days.<sup>1</sup>

One more point is of interest. Did the aged and delicate, the complicated and the intemperate have as good a chance for recovery under the old heroic treatment as with the later sustaining one?

Counting all the cases of these classes together, which means that many are counted twice, we find before the year 1860, or during the heroic period, 62 cases among these classes, with 25 deaths, and after 1860 397 cases, with 165 deaths. Reduced to percentage, we find the mortality to be almost exactly the same, namely, 40 per cent. in the first period and 41 per cent. in the second period.

We must, however, admit that the present treatment of expectancy, a treatment which makes the patient as comfortable as possible, preserves his strength and avoids everything harsh, is certainly

<sup>1</sup> The table shows the average duration of fever and stay in the hospital in each decade.

	1822 to 1829.	1830 to 1839.	1840 to 1849.	1850 to 1859.	1860 to 1869.	1870 to 1879.	1880 to 1889.
Fever (days)	10.5	8.7	9.1	9.1	8.9	9.5	9.2
Stay in hospital (weeks)	3.6	3.5	3.8	3.7	4.2	3.4	3.6



far more agreeable to the patient than the former heroic method.

After these studies we cannot but admire the regular and uniform manner in which pneumonia—that type of self-limited diseases—has run its course in all these years uninfluenced by the varying treatment it has received.

#### SUMMARY.

1. In the 1000 cases of acute lobar pneumonia treated at the Massachusetts General Hospital from 1822 to 1889, there was a mortality of 25 per cent.

2. The mortality has gradually increased from 10 per cent. in the first decade to 28 per cent. in the present decade.

3. This increase is deceptive for the following reasons, all of which were shown to be a cause of a large mortality:

(a) The average age of the patients has been increasing from the first to the last decade.

(b) The relative number of complicated and delicate cases has increased.

(c) The relative number of intemperate cases has increased.

(d) The relative number of foreigners has increased.

4. These causes are sufficient to explain the entire rise in the mortality.

5. Treatment, which was heroic before 1850, transitional between 1850 and 1860, and expectant and sustaining since 1860, has not, therefore, influenced the mortality rate.

6. Treatment has not influenced the duration of the disease or of its convalescence.





